ZAPCO

DSP-IV II SERIES
Owner's Manual

Before operating the unit, please read this manual throughly and retain it for future reference.

MISSION STATEMENT

Committed to Excellence

ZAPCO is dedicated to the pursuit of audio fidelity. Our prime objectives are to design and manufacture audio products of unsurpassed quality, to provide unparalleled support and service for these products and to conduct business in a manner that will enhance the quality of life for all involved.

Experience
(Knowledge from doing)

There is absolutely no substitute for experience; that is a simple fact of life. Another simple fact is that ZAPCO has, for over forty years, been the leader in defining quality standards for the car audio industry.
These years of experience have led to a thorough understanding of the challenges that are unique to the world of car audio. ZAPCO's relentless quest for sonic purity consistently yields imaginative designs that utilize the most innovative technologies. The resulting products set the criteria by which all others in the industry are judged.

The Zapco DSP-Z8 IV II Series
DSP-Z8 IV II Digital Signal Processor and ADSP-Z8 IV-8 Amplifier/Processor

Congratulations on your purchase of this new Zapco DSP-Z8 IV II series product. It has been designed and built to give you many years of reliable, industry leading performance and true audiophile level sound quality.

Zapco Introduced the world to full function in-car digital processing in 2004 with the Zapco DSP-6 and the Zapco Digital Processing Network. This was the first full function DSP for the car and included a full line of amplifiers with full function digital processing build right in. In 2016 we brought out our fourth generation of processing in the Zapco DSP-Z8 IV. The Z8 IV was a mid-priced unit designed to bring audiophile processing in an affordable package, and it did just that. The Zapco DSP-Z8IV met rave reviews, out performing DSPs costing twice as much, with a straightforward, easy to navigate interface so tuning would be a breeze, and an analog signal to noise of -106dB (-110dB Digital).

The new DSP-Z8 IV II series processing takes the IV to a whole new level. Sonically the DSP-Z8 IV II has all the qualities of the original IV with an even lower noise floor. For advanced tuning possibilities the VI II has a much-improved GUI with many important upgrades.

In addition, for all those who need everything in a very small package, the DSP-Z8 IV II series bring all this great processing to the ADSP-Z8 IV-8, an eight-channel full range Class D amplifier with 80 Watts RMS per channel, at 4 ohms. That puts the Z8 IV II processing and an 8-Channel amplifier in a single convenient one-box installation.

Reality Check

The automobile is a difficult environment for listening to music. There are reflective surfaces that distort the sound, absorptive surfaces that impede it, and you are never in the ideal listening position. The Z8 IV II processing will allow you to compensate for the shortfalls of the auto environment to create the live listening experience. However, we highly recommend that you engage the services of a professional installer experienced in system tuning as a final step. A professional tuner will have many hours of experience in system tuning and the necessary tools, like a Real Time Analyzer and distortion analyzer to see how the sound waves are acting in your vehicle. With the proper tools and experience a professional can tell what frequencies to boost, which to cut, and what other minor tweaks are needed to get the best live musical experience from your car.

Installation

The basics of car audio installation apply to both the DSP-Z8 IV II and the ADSP-Z8 IV-8.

Getting Started*: The very first thing you want to do when installing any electronic device into the car is to disconnect the negative battery terminal to prevent any accidents (dropping a live hot wire on a component that has been mounted to the metal of the car can destroy that expensive piece of gear you just bought).*

Choose a secure mounting location for the DSP-Z8 IV II unit. You need to avoid sources of heat and moisture and provide adequate ventilation for cooling. Check around and under the location for any wires, hoses, etc. before drilling holes. Also avoid mounting the unit too close to any main electronic control modules as they can be bad noise sources. Plan out the power and signal wiring to the DSP, and then out to the amps (or speakers if you have the ADSP-Z8 IV-8). The Dash Remote wire needs to be run to the mounting location also, as well as any optical or auxiliary input cables. Depending on your installation, you will probably want to run all the wires and cables to the unit's mounting location before mounting. Once the area is prepared, mount the unit securely using the proper hardware.

Power*: Main +12V power to the amp must come directly from the Battery + terminal and should be 4-Gage or larger depending on the length needed. The yellow B+ power for the DSP should come from a power source that is constant hot. Whether it is a processor or a processor/amplifier, the single biggest cause of system noise is a weak or insufficient ground connection. This is especially critical for the amplifier as a weak ground will also prevent the amplifier from reaching its full power. The ground connection should be directly the vehicle chassis/frame (or a heavy chassis panel directly connected to the frame). The gage of the ground wire should be at least as large as the gage of battery power wire.*

Physical Connections*: The two units of the Z8IV II series share most of the same processor connections but with slightly different layouts. Of course, the ADSP-Z8 IV-8 requires much more input power and has speaker outputs.*

DSP-Z8 IV II
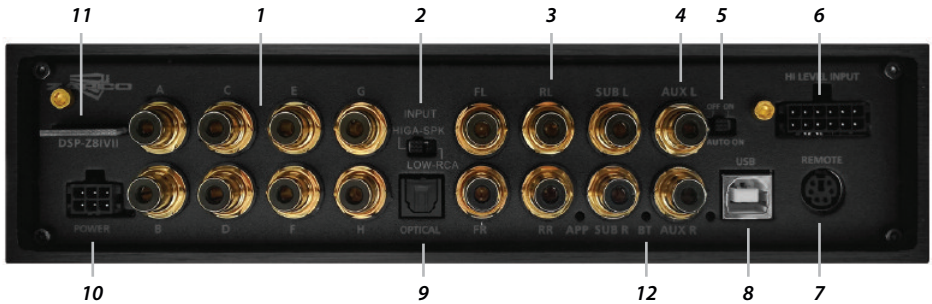
1. *8 channels of RCA outputs*
2. *Switch for high level/low level inputs*
3. *6 channels of RCA inputs for the MAIN source*
4. *2 channels of RCA inputs for an Auxiliary source*
5. *On/Off switch for the auto-on function*
6. *High level OEM input connector*
7. *Dash remote port*
8. *USB connector for PC control*
9. *Optical port for digital input*
10. *Main power connector for +12V Power (yellow), Ground (black), Turn-on from head unit (red), and +12v for amplifier turn-on (blue)*
11. *Bluetooth antenna for Digital streaming and control*
12. *BT indicator-blinks while looking for a Bluetooth device, then goes solid when it is paired*

ADSP-Z8 IV-8

1. *6 channels of RCA inputs for the main source*

2. *2 channels of RCA inputs for an Auxiliary source*

3. *Optical port for digital input*

4. *Dash remote port*

5. *USB connector for PC control. The indicator lights when the USB is connected*

6. *High level OEM input connector*

7. *On/Off switch for the auto-on function*

8. *Switch for high level/low level inputs*

9. *BT indicator blinks while looking for a Bluetooth device, then goes solid when it is paired*

10. *Speaker output connectors for Ch 5~8*

11. *Speaker output connectors for Ch 1~4 [Note 1: the Left Ch (odd) positive terminal and the Right Ch (even) negative terminal are used for bridging the speaker outputs. Note 2: the amp is stable at 2 ohms stereo or 4 ohms mono. The amp should not be run at 2 ohms mono]*

12. *Main +12V connector, +12 trigger from head unit when the Auto-on is turned off, Main Ground connector*

The DSP-Z8 IV Control Systems

The new Z8 IV II DSPs can be controlled by your PC or by iOS and Android smart devices. Because of the restrictions of screen size, there are a few things that are easier using the PC GUI, so we will cover that first. We recommend the first setup be done by PC. In addition to the PC and Mobile controls that allow a complete system setup, the DSP-Z8 IV II units also come with an included Dash Remote.


1. *Unlike many remotes, the remote of the DSP-Z8 IV series is an integral part of the device. First it is a volume control, which is a must when you are using a full gain digital input. Secondly, the volume control is also a control for the bass output. If you are using Channels 7/8 for the bass, as most users do, you can push the volume control in one time and the bass level will begin to flash and it becomes an output level control for channels 7/8.*
2. *The readout normally gives you the volume level. If you push the Volume knob one time it gives you the bass level. If you don't make any adjustments for about 15 seconds, it will return to reading volume.*
3. *If you push the Volume knob 2 times you will see only MODE and the mode number flashing. Mode is the memory preset. In mode function, the volume knob cycles through the presets that have been stored.*
Dial to the preset you want the push the volume knob once to get input source selection or twice to return. Any preset positions not used will not show up in the MODE choices.
4. *If you press the volume knob three times you will enter Source Selection and you can choose Main, BT (Bluetooth Streaming), Aux, or Opt (Optical) by turning the volume knob to the input you want.*

# The Zapco DSP-Z8 IV II Graphical User Interface (GUI)

You have downloaded this preliminary manual from the web site along with the control program. If you haven't installed the program on your computer, you should do that now. You open the compressed file and click on the installation .exe file. You will see the usual installation prompts as the program is installed. After the program installation you will see the driver installation. After the drivers are installed the PC will restart to finish the GUI installation.
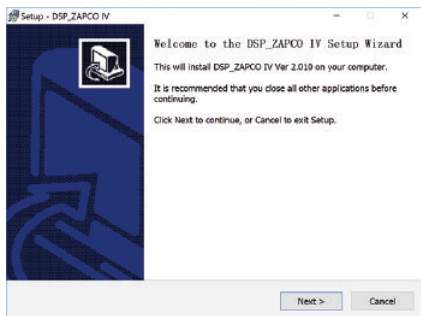
Installation process

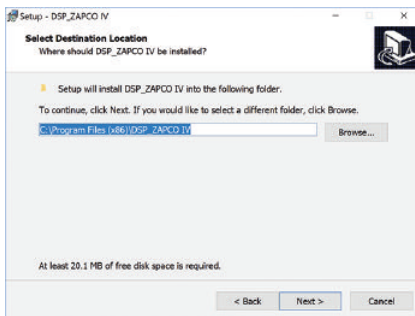*Below are the screens you will see during the program installation*
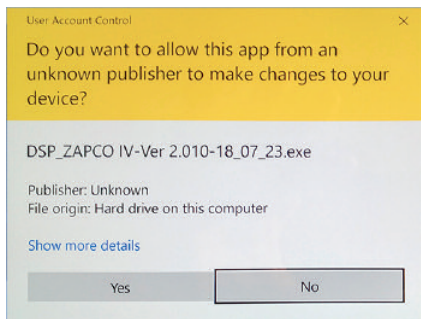
1. *Click YES to allow the program to install*
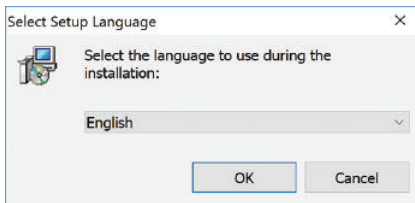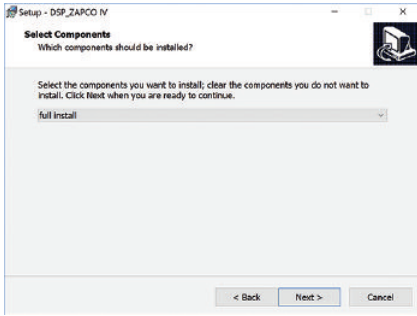
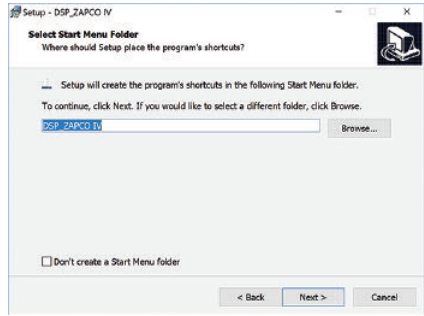**2.** *You can choose to use either English or Chinese*
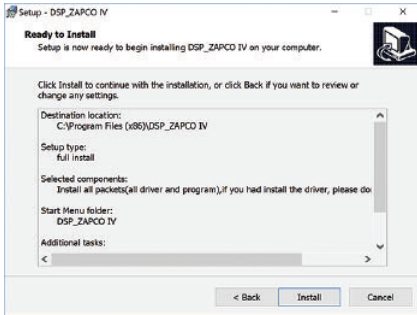

3. *Close any open programs then click NEXT*

4. *Click next to create a folder for DSP Zapco*

5. *Click next for a full installation*

6. *Click NEXT to install the menu icon*

7. *Click INSTALL to proceed*
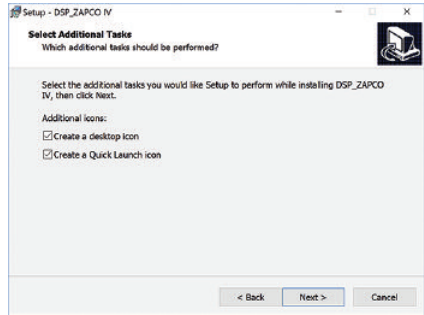
8. *Click NEXT to install desktop icons and the installation will begin*
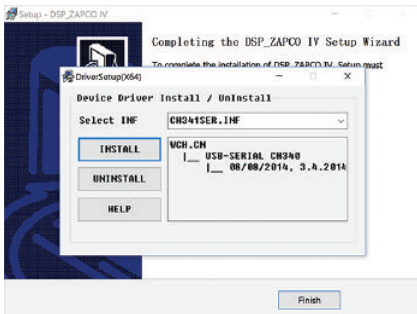
9. *After you click Next in step 8 the program Installs. After the installation the drivers must be installed. When you get the prompt at the left, computers differ. The driver installation may be automatic, or you may need to click the INSTALL box. Then drivers will install, and the computer will restart. After the restart you can open the GUI from the desktop icon shown.*

From the Desktop Icon

If the DSP is not connected, you can click the icon and choose to open in offline mode as below. Click the desktop DSP_ZAPCO IV Heat Sink icon.

1. *Click OK to go to the next screen*

2. *Click YES to open in offline (demo) mode and the GUI will open*

If the DSP is already connected by USB, you can click the icon and open the GUI in live mode. If you have already connected the DSP or ADSP to your PC, you will get a different opening screen.

If your PC is connected to the DSP, the system will ask you to designate a password that will be required in the future to make modifications. This is important since anyone with a smart phone can connect to the Z8 IV II GUI. The password will prevent unauthorized access to your DSP settings. Make your password easy to remember. Zapco will not have access to your password so please write it down and store it someplace. After you designate a password the system will ask you for your phone number.

Anyone trying to open the system without the correct password will be directed the phone number you enter here to retrieve the password. This will be useful if a car audio dealer is working on your car and can also a valuable tool to let you know who wants to enter your DSP. Once the password is entered and you click OK, PC Control screen (GUI) will open.

Graphical User Interface (GUI)

From the top left, this GUI is designed to take you smoothly through a system set-up. At the very top of the GUI there is a FILE button with a drop-down menu. This is where you can save and Load files and memory presets. See System Setup for more on the file button.
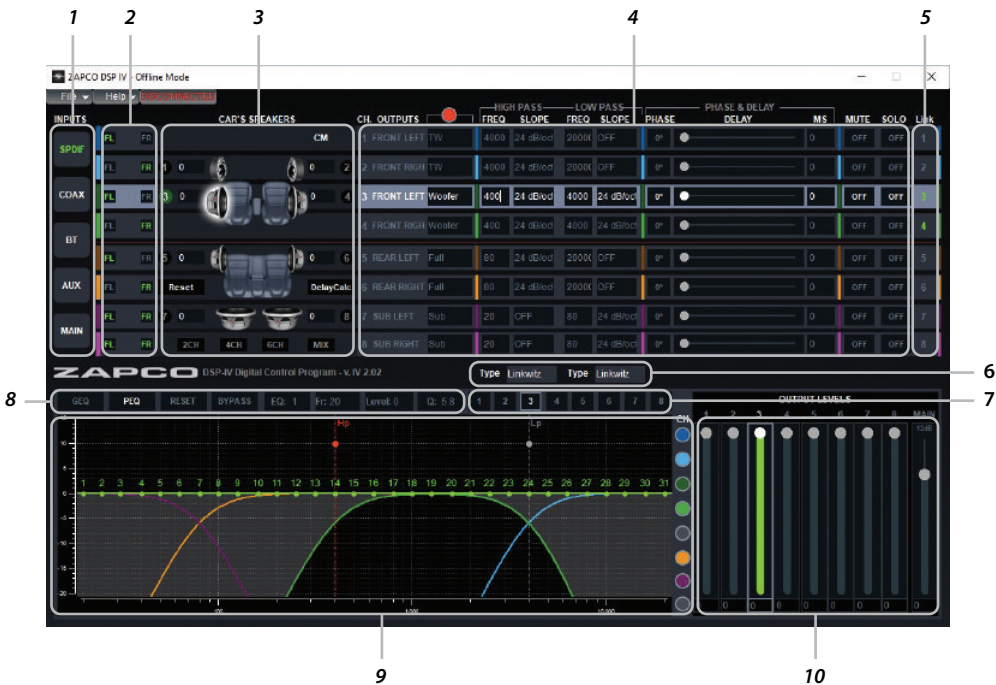
1. *First you will choose an **Input** from Main (head unit), Digital SPDIF, Analog AUX, or the new Digital Bluetooth Streaming. There is also an extra button (now labeled COAX) for future expansion. For the main input you can choose 2Ch, 4Ch, 6Ch, or OEM MIX. In MIX all the left channel information and all the right channel information will be summed to a single full range stereo pair.*

2. *Next to Inputs a default **I/O map** will send the default input information to each output channel based on the input you choose. However, you can override the default choices by simply clicking into the input you want for each output channel.*

3. *At the **Car's Speakers** diagram, you can enter the distance from your listening position (actually your head) to each speaker in the system and enter that in the speaker diagram, then click Delay Calc and the system will figure and install the correct signal delay for each speaker.*

4a. The **CH Output** column is where you choose the channel you wish to adjust. This column lists the speaker channels by position. Next to each speaker position you can use the drop-down menus to define the function of each Left and Right speaker as Full Range, Tweeter (TW), Tweeter/Mid, Woofer, Center, or Sub.

4b. Crossovers: As you assign the functions to the speakers in CH OUTPUT, the system will engage default crossovers. This is so speakers will be protected should the volume be turned up unexpectedly. Here you can see the default settings and make the needed adjustments to the crossovers, to match your particular speakers. You have a wide choice of crossover styles [See #6 below] and slopes for the crossover filters. Next to the crossovers, you will see that the **Delay** section. Here you can see the default delays set by the measurements in the car diagram. This delay section allows the experienced tuner to make fine adjustments if needed, but for most users the automatic settings done by the program will work best.

4c. Next you can adjust the physical and acoustic phase (polarity) of each pair of speakers and between pairs*.

4d. This is made easier with the **Mute and Solo** buttons, which allow you the listen only to the speakers you are tuning or even switch between two speakers with the Solo buttons, for A/B comparisons if you are equalizing Left and Right speakers separately (this is recommended only for experienced tuners).

5. Channel Link for Crossover, Delay and Output level: There are two link functions on the Z8 IV II GUI. This vertical row of link buttons allows the user to link channels so changing one channel also changes any others in the link group. Most commonly this is used in setting crossovers. See under System Setup for more information on Linking.

6. Crossover Styles: Here you can choose to have Butterworth, Linkwitz-Riley, or Bessel style crossovers. The default crossover style on the DSP-Z8 IV series is Linkwitz-Riley @ 24dB/oct., as it is phase neutral.

7. Equalizer link buttons: Above the EQ graph you will see a horizontal row of link buttons. These link buttons are used for the Equalizer only. As with the other link buttons, the active channel you have chosen will always be highlighted. You can link another channel to it by clicking the link button. Normally only the active channel is highlighted in the CHANNEL SELECT row, but when you link channels all the linked channels are highlighted as a reminder that they are linked. See more under System Setup.

* Phase Polarity 0° or 180° is critical to a sound system. See Polarity, under System Setup. If speakers are not all moving in the same direction at the same time, no amount of tuning can ever create a correct sound stage or a smooth frequency response.

8. The **EQ Function Bar**. This row lets you choose between GEQ (Graphic) and PEQ (Parametric) equalizers. You can also Bypass the EQ temporarily to hear the sound with and without the effects of your tuning. The Reset button resets the channel completely to return the EQ filters to flat. There are also buttons for the EQ parameters: Band selection, Frequency selection, Gain, and Q Factor. You can click into these boxes to make fine tuning of each parameter.

9. The **EQ Graph**: The graph shows you exactly what you are doing to the output signal going to your amps. In this graph to can Drag-and-Drop the buttons of each EQ filter to make adjustments of Frequency and Gain. Then make fine adjustments using the PC's keyboard arrows. Simply click into one of the parameter boxes and use the keyboard arrows. The active channel's EQ plot will always be visible, as will the crossover plot for the active channel. At the right side of the graph, the color-coded buttons let you choose any other channels whose plots you want to see as well. The area under the active channel's crossover will always be highlighted. This allows you to see at a glance what frequency areas you can work on in the active channel, and which frequencies fall into a different channel's crossover range.

10. Output Levels: Output levels allow you to balance the levels of the speakers. Ideally they should all be near 0dB.
Then you can back off any speakers that are too loud. The main level control can have gain up to 12dB for low power head units. But you reduce signal to noise ratio when you are set above 0dB. It is far better to keep the output at 0dB and adjust the amplifiers, if you need more volume.

The DSP-Z8 IV II Mobile Apps

*The Zapco DSP-Z8IV II apps for Android and iOS are identical and allow you to setup and tune your system with your smart phone or tablet. The goal here was to have a control system that made sense in a smaller platform but would allow the user to do everything necessary for a complete setup and tine. With the system on, you will see **zapco dsp music BT ####** and **Not Connected**. Choose that BT to connect to the DSP and the indicator will light constant blue.*

*When you open the ZIV II APP on your smart device, it will sync to the settings that are in the active preset in your DSP, so you will always open the app to the settings you were last listening to. After the APP Syncs to the DSP, the **Opening page** gives you immediate access to the System Volume (**1**) and the Subwoofer Volume (**2**). A drop-down menu (**3**) shows the active signal source. You can click the source menu to get all the input choices if you want to work in a different input source. At the bottom is the DSP "Mode" (**4**). The active preset will show. Here you can choose a different memory preset to start from if you wish. The speaker icon (**5**) lets you quickly mute all channels. Advanced Setup (**6**) opens all the tuning pages but cannot be opened in "Demo" mode. You can only enter Setup after the Smart device is paired to the DSP and has been sync'd.*

The Channel page serves as the main system setup page. Like in the PC GUI, the **Channel page** will open on the locked mode and you need click to un-lock (*1*) before you can set the channel (speaker) functions using the drop-down menu. The choices here are the same as with the PC GUI. The in/out mapping (*2*) is set up differently but functions the same. The available channels, depending on you input selection, will show in the window. Click and a drop-down will let you decide the inputs (*3*) at each channel number lets you set each channel's function.
The channels output level (*4*) is set by the slider and the level shows in the window.
The speaker icon (*5*) for each channel will mute the channel and you can click the polarity (*6*) to toggle between 0° and 180°.
If the page is unlocked the Default button (*7*) will put all parameters to the default positions. You can drag the display up to see the hidden channels and set them. When you set the speaker functions in the Channels page, the system will assign default crossovers to protect your valuable speakers from frequencies that can be dangerous to them.

When you are finished re-lock the page to prevent accidental entries.

*On the **Crossover page** you can customize the crossovers to fit the needs of your individual system. You have all the choices of crossover styles and slopes that the PC GUI has by using the drop-down menus in the parameter boxes of each channel. The mobile apps do not have the crossover link functions of the PC, so each channel's crossover must be set individually. Left/Right channel pair should always have the same crossover.*

*The **Delay page** lets you enter the distance in CM or Inches and after you have calculated the correct adjustments ir immediately gives you the applicable delay in milliseconds for a rock solid and accurate front stage. See the chart below:*
a) Measure from each speaker to your ears
b) Note the distance of the farthest speaker
c) Subtract each of the other speakers from the farthest to see how much adjustment is needed.
d) Enter each speaker's adjustment distance on the Delay Page
e) Now each speaker will sound like it is the same distance as the farthest speaker, and you will sound like you are right in the middle.
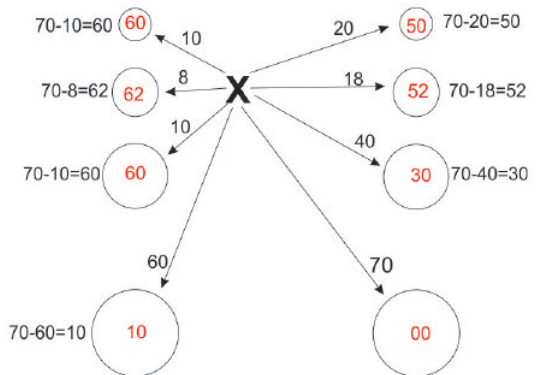
The **Equalizer page** holds the heart and the brains of the App. You can use either the Graphic or the Paragraphic EQ's. You can link channels for equalization and from this page you can save a load presets and files. This special page warrants a quick look at each of its parts.

1. The EQ sliders let you adjust each band between +12dB and -17dB. You can slide the bands across the screen to display all 31 bands.
2. Status readouts show the current Frequency, Q factor, and Gain setting of each band.
3. When you activate the paragraphic EQ you can use the sliders to adjust frequency and Q.
4. CH Buttons let you choose the channel you wish to adjust.
5. These link button let you link channels together for equalization. Note that you must turn the links off manually in the mobile apps.
6. These are the Reset and Bypass buttons in the mobile apps. Also, on this line is the selector to turn on the paragraphic equalizer (default is GEQ).
7. The up/down arrows can be used for fine adjustments of EQ parameters.
8. The EQ graph shows what you are doing to the signal going to the amplifiers.
9. Open File loads an EQ preset from a file on your mobile device.
10. Save File saves the current settings to a file on the mobile device.
11. Open Scene loads a preset from a DSP memory position.
12. Save Scene saves the current settings to a memory position in the DSP.
13. Multi Curve is a drop-down that lets you choose to display more curves in the graph along with the active channel.

Setting Up Your System

Before you start

1. Make sure you have time to finish the process. You should set aside a good couple of hours to go through the process, save it all, and do some listening and re-adjusting.

2. Make sure the installation is mechanically and electronically sound. It makes no sense to add processing to a system if you haven't provided the groundwork to let the components operate to their full potential. This means sufficient 12-volt current and good solid ground for the amplifiers and other components, so they get full power with no noise.

3. Make sure all speakers are wired correctly, positive to positive, and negative to negative. We will discuss this (phase/polarity) more, later in the set-up.

4. Do the research on your speakers. Make a note of the recommended crossover points and the slopes.

5. What is the input source? If you are using an OEM stock head unit then you will need to be sure you have all the inputs needed to achieve a full range input for the DSP. Once the needed speaker input leads are connected to the high-level input cable, the MIX button on the GUI will sum the signals together so all processing channels will have a full range signal.

6. Download an RTA. Accurate Real Time Analyzers are expensive equipment. A professional unit will run well over $1,000.00. You can put together a decent system for a laptop for about 150.00 to 200.00. However: You can download an app for a smart phone or tablet that will get you started for free. More advanced smart phone apps are available from $20.00 to $40.00. While these free and low-cost apps are not as highly accurate as those for professional use, they are fairly close, and are far better that working with no tools at all.

The file menu

Saving your work is critical. Whenever you have the PC (or a mobile device) connected to your DSP all the work you are currently doing is at risk of being lost if something should happen to cause a loss of power to the system or to close the GUI prematurely. So, like anything else in a computer, save and save often. Saving and Loading of files and presets is through the FILE menu in the upper left corner of the GUI.
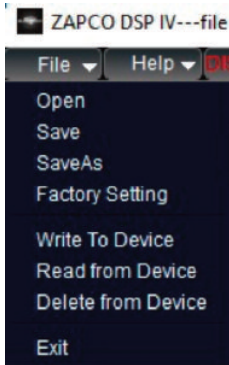
The file menu allows you to:

1. **Open** a file that has been stored on your computer
2. **Save** a file that you want saved on the computer
3. **Save As** lets you choose a location to save the file in**
4. **Factory Setting** will let you completely erase all current settings
5. **Write to Device** puts the current settings into a DSP memory preset
6. **Read from Device** loads a saved memory preset from the DSP
7. **Delete from Device** allows you to delete one or more presets from the DSP

**For saving files to the PC you should create a sub folder in the PCs Documents named DSP Settings. The first time you save a file you click Save As and navigate to your DSP Settings folder. Then highlight the systems file name, enter a name you create and click Save. Occasionally you may need to do this a couple of times but usually after the first time that you Save a file and Open a file those functions will automatically take you directly to the correct folder. If you do not wish to name the file you can use the system designated name.*

Write to Device will open the memory preset menu. There you can choose to save in any of 10 preset positions. Unused positions have a green background while the currently used presets have a red background. Click Select Save Place and choose a green position. If you select a red position you will overwrite whatever is there with the new parameters. When you click Save you will be asked to give a name for the preset. You choose a name and click OK and the preset will be saved. You will see the save progress and then system will tell you the save was successful.

Read from Device works the same way. You will get the Read from Device menu and at the bottom you can Select Read Place, choosing any of the saved memory positions, and then click Read to load the settings of that memory preset into the DSP.

Delete from Device opens a similar menu screen and you choose the preset you no longer want and click Delete. The Delete menu will stay open so you can delete more than one preset if you wish. When finished you can click the X to close the menu.
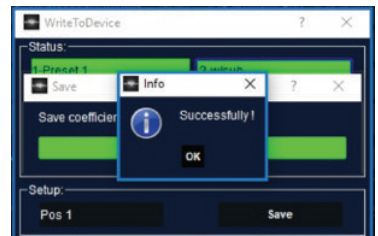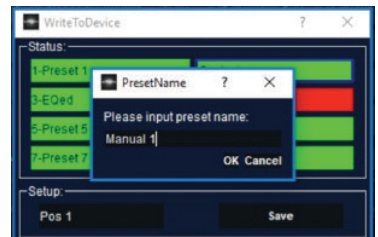
The setup

This GUI is designed to take you smoothly through a system set-up, and we made some major improvements in both control and features.

*Each of the 10 memory presets will store the current input source and all current parameters, so the first step is to choose the input (**1**) you want to use for the setup. All inputs except MAIN are 2-Ch inputs. The **Main input** can be 2-Ch, 4-Ch, or 6-Ch. (**2**), and either an aftermarket head unit or a factory OEM stereo. If the Main input is from a factory stereo with active crossovers you can click MIX to sum the left channels together and the right channels together to form a single full range 2-Channel input. The **Channel map** (**3**) for the main input will be in default mode after you choose the input type. If you need to change the input for any channel you can do that here, by clicking on the input you want to use for each channel and clicking off any you do not want to use. Once your channel map is fixed you measure the distance from where your head will be while listening, to each of the speakers (in cm) and enter those distances in the **Car Speakers diagram** (**4**). After the distances are entered you can click DelayCalc and the system will calculate enter the delay for each speaker in the delay section. After you measure the speaker locations for delays for each channel, you need to tell the system what each speaker location is doing.*

CH. OUTPUTS		HIGH PASS FREQ	SLOPE	LOW PASS FREQ	SLOPE
1 FRONT LEFT	TW	3000	24 dB/oct	20000	OFF
2 FRONT RIGH	TW	3000	24 dB/oct	20000	OFF
3 FRONT LEFT	TW/MID	500	24 dB/oct	3000	24 dB/oct
4 FRONT RIGH	TW/MID	500	24 dB/oct	3000	24 dB/oct
5 REAR LEFT	Woofer	80	24 dB/oct	500	24 dB/oct
6 REAR RIGHT	Woofer	80	24 dB/oct	500	24 dB/oct
7 SUB LEFT	Sub	20	OFF	80	24 dB/oct
8 SUB RIGHT	Sub	20	OFF	80	24 dB/oct
IV 2.02		Type	Linkwitz	Type	Linkwitz

*The **Ch. Outputs** (**5**) are listed on the left side. Channels 5 and 6 are listed as rear speakers and 7 and 8 are listed as subs but using the drop-down function menus you can make each channel be whatever is needed for your system. The choices are TW (tweeter), TW/MID (tweeter or Midrange) Woofer (woofer/MidBass), Center, Sub, Sub Left, Sub Right.*
*Note: To prevent accidental changes to speaker function there is a Green/Red button (**6**) at the top of the function column. You must click this button to Red before you can change speaker functions. When you are finished with the function column you should click the button back to Green.*
*When you make your function choices the system will assign default **Crossovers** (**7**) to protect the speakers from damaging frequencies. So the next step is to review the information from your speaker manufacturer to see what crossover frequency and slope they recommend. Note that crossover slopes are always a function of power. If you have more power that your speaker recommends you can raise the crossover point to help protect the speaker or use a steeper crossover slope. The best choice is the contact the speaker maker and ask their advice. Since Left/Right speaker pairs should have the same crossover parameters, it is handy to avoid mistakes by linking the channels.*

*The vertical **Link** (**8**) column in the picture below allows linking of crossovers, delay, and gain. To link the channels, you pick a channel from the Ch. Outputs column (i.e. ch. 1), then you click the channel you want to pair (i.e. ch. 2). Now the parameters you set for Ch1 will also be set for Ch2. When you choose the next channel (i.e. ch. 3) the current link will be broken, and you can now pair Ch4 with Ch3 and set the next crossover. NOTE: Any time you select a channel from the Ch. Outputs column any active links will be broken.*

Phase (Polarity)

With the crossovers and delay set the next step to a correct sound stage is to check the phase of the system. The first step in this is to assure that during installation the positive to positive and negative to negative speaker wiring was connected correctly. However, because of the nature of car interiors it is still possible that you could be acoustically out of phase. There are several methods of checking phase that you can research. We offer one here.
System phasing can be a pretty long procedure if you haven't done it before, but it is critical to having a good sound stage and frequency response, so take your time.

*Tools needed: Music source with high female vocal solo. Music Source with strong male vocal solo. Music Source with strong mid-bass (like kick drums).Mute Buttons: At the upper right section of the GUI you will see a row of **Mute** (**9**) buttons. When you turn on a channel MUTE, that channel goes silent. You will use the Mute button to turn off the channels you do not want to hear while you are checking phase.*
Quiet Please: Outside noise will distort what you hear in the car. You cannot make these (or any) audio adjustments unless you are in a quiet environment. Especially during equalization where you will risk long term damage to equipment by trying to compensate for outside noises.

Begin phase check: R/L Balance in the middle

A. Tweeters; *Click to **Mute** (**9**) all channels except the tweeters. Note that tweeters are the most difficult to phase. They are the smallest drivers and are not loud. You need complete quiet. Play a music track of female vocal and notice where the vocal originates (you may need to lower the crossover point for this. If so, keep the volume low and you may want to use a 48dB slope, so you do not blow tweeters. We have already set the calculated delay, so the vocal should come from a specific location near the center of the windshield. If the tweeters are not correctly in-phase, then the sound will not have a specific location. It will splash and seem to come from everywhere at the same time. You will not be able to locate the sound at a specific spot. To the left of the Delay bars you see the **Phase** (**10**) buttons. All should say 0 at this point. Click the Right channel tweeter to 180 and listen for the difference. Do this a few times and you will see that in one position the vocal is easily located near the center of the window while in the other it seems to come from everywhere and cannot be located. Obviously, you want the right speaker to be in the polarity that puts it in phase with the left, so the image is centered in the middle of the dash. NOTE: Once you establish the proper phase combination of a pair of speakers, it never changes. You do not change one without changing the other as they are now a matched pair. If you have changed the crossovers of the tweeters for phase check, you can put them back to normal now.*

B. Midrange and Woofer/Mid-Bass; *Now mute all but the midrange. These are easier because phase is more obvious at lower frequencies and because you can use more volume. The procedure is the same but now you should use the male vocal. Listen for the vocal location. It should be at a specific location near the center of the window. Change the phase of the right speaker a few times and listen to the difference. Use the combination that puts the vocal in a specific central location. Then you can mute all but the Mid-Bass and do the same as for the midrange. Note; Another easily heard sign of phase in midranges and woofers is bass. When 2 speakers are out of phase there will be less bass. More bass in-phase/less bass out-of-phase, listen for this in addition to the localization.*

C. Subwoofers; *Woofers are the easiest. Play something with bass. The male vocal should work fine. If you are using multiple woofers they must be in phase or your bass will go away. When you change the phase of the right woofer it will be extremely obvious which polarity is correct.*

Note: Now you have phased each pair of speakers. Hopefully all are still 0, but if not it's OK, but from now on they can only be changed by the pair. Never change only one driver out of a pair. It's best to make a chart of speaker phases so you have it for reference later.

Phasing the System: Setting the front stage

D. Tweeters to Mids; *Now we start phasing the driver pairs to get a proper front stage. Again, from here on we change only by the pair. Mute all except the Tweeter and Midrange channels and listen to a musical track. The main vocal should be centered and the sound stage should be spread across the window about 1/2 ~ 2/3 the way up. Listen for this. Now change the phase of both midranges and see where the sound stage is. If the tweeters and mids are out of phase, the stage will be lost (usually it will drop toward the floor). Do this a few times (always changing only the mids) and see which position puts the sound stage higher up where it should be, right across the window. You will leave these this way now and bring in the Mid-Bass.*

E. Woofers/Mid-Bass; *Un-mute the mid-bass and see where the sound stage goes. If it pulls down to toward floor, then reverse the phase of the mid-bass drivers. Try both ways a few times to see which gives the correct sound stage.*

F. Subwoofers; *Subs can be difficult, but not because of bass. You have already phased the woofers. There will be bass! The issue will be the transition from bass to mid-bass. Play a cut with good mid-bass (kick drums are excellent). Look for sharp solid mid-bass. Change the phase of the subs a couple of time and listen. A bad transition will leave mid-bass soft and weak. Also listen for location. you want the bass to be in the sound stage...not in the trunk. If your woofers are in a portable enclosure you may even want to move the box location to see what that does. The Key is finding that combination that gives clean solid mid-bass that seems to come from the front of the car.*

Now you have set the R-to-L phase of each pair of speakers and you have blended each pair into the system in the correct phase for the best sound stage.

SAVE: *At this point you completed the system setup and will want to Save to File then Write to Device to save the work. Write to 2 memory positions so you have one to work on and one as reference.*

Tuning

At this point you have effectively set up your entire system. Each channel has the correct input, each speaker has been identified as to function, the crossovers have been set for each speaker, the delays are set for the proper sound stage and you have assured that all speakers are operating in the same polarity acoustically. Now it is time for the most difficult and most subjective part. Tuning the system to have the correct sound in the car. Since every car is different from every other car, the tuning must be done specifically for your individual car and your specific equipment. A car is a poor listening environment because so many factors in the car change the sound as it moves through the car interior. Windows, upholstery, even the very shape of the car all affect the sound waves and you need to tune the system to compensate for those affects.

The goal is to get the sound the artist intended, even though you are sitting in your seat in the car, and not at a concert. To do the tuning you will need a 1/3 Octave RTA (Real Time Analyzer) and a source of "pink noise". Pink noise is sound that has equal signal levels at all octaves. It is a standard of reference that, in conjunction with an RTA can show you what your car is doing to the frequency response. Then you can compensate with the equalizer. Also handy is a 31 column sheet to chart the response before equalization.

The Tuning Tools of the GUI

You will use the EQ graph and the Function bar above for making the EQ adjustments. Below we lay out the EQ tuning functions.
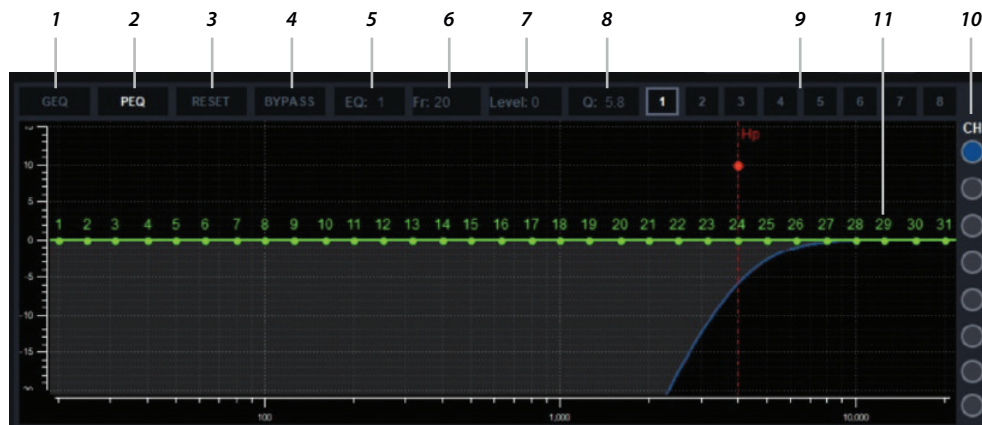
1. GEQ: *There are two types of Equalizer in the DSP-Z8 IV II GUI. The early EQs were Graphic EQs. Each band had an assigned frequency and an assigned Q factor. Q determines the shape to the filter. A low Q gives a wide adjustment and a high Q gives a narrow sharper adjustment. In most early EQs your only adjust was the level of boost or cut that was made with the filter band while some had adjustable Q.*
2. PEQ: *More popular today is the Parametric Equalizer or PEQ. The parametric EQ allows you to put the filter at any frequency that needs attention, so any filter can be at any frequency. It also allows you to determine the Q of the filter, so you can boost or cut a large group of frequencies or you can pinpoint only a few frequencies to be affected. By watching the RTA while you are making adjustments you will see how wide or narrow the adjustment needs to be and you can adjust the Q accordingly.*

3. Reset: Occasionally you may decide you don't like what you've done to a channel. The reset button allows you to reset all the filters of a channel to 0dB.

4. Bypass: The bypass button lets you temporarily bypass the EQ of a channel to hear the channel with and without equalization for A/B comparisons.

5. EQ: This is the EQ band box. You can which of the 31 EQ bands you will adjust by clicking on any of the green band buttons and using drag-n-drop, but you can also click into the EQ band box and type in a band number or use the up/down arrows of the keyboard to scroll through the bands.

6. Fr: Similarly, the Fr: box lets you change the frequency of a band. If you have made an adjustment and the frequency is not quite right, you can click into the Fr: box and move the center frequency up or down with the up/down arrows.

7. Level: As we said before, you can drag-n-drop a band button to make EQ adjustments, but they will be rough adjustments. If you click into the Level box you can make fine adjustments .5dB at a time using the keyboard arrows.

8. Q: Clicking into the Q box lets you change the shape of the filter using the keyboard arrows. While watching the RTA you can see exactly what your changes are doing to the acoustic response as you make the the fine adjustments.

9. EQ Link buttons: The first Equalization should always be done by R/L channel pairs. To do this you use the EQ Link buttons. Example: Click Ch1 in the CH OUTPUTS column to open Ch1. The Ch1 button 1 will be highlighted and the Ch1 row will be bright. Now you can click 2 and Ch2 will become bright as well to let you know than Ch1 and Ch2 are linked. The next time you click any channel in the CH OUTPUTS column the link will be broken. Notes: a. You should only link 2 channels at a time b. After the first equalization you can modify one channel or the other and then re-link them for further adjustment, but this should only be done by experienced tuners. 99% of all installation will have the best results by paired channel equalization c. It is possible to link all the channels except the Subs. The subs can only be linked to each other. This linking again however should only be used by experienced tuners.

10. Trace buttons: You will always see the EQ and Crossover traces of the active channel being worked on. The color-coded buttons at the left allow you to include other traces in the graph so you can see how they interact.

11. The EQ graph will always show all the available bands for the active channel as the green band buttons. Before any adjustments they are all on the 0dB. After adjustment the buttons will in their position on the response curve (the trace) you have set with your adjustments.

What We Want to Achieve

You will use the EQ graph and the Function bar above for making the EQ adjustments. Below we lay out the EQ tuning functions. Of course, there is no way to know what the response in any particular car will be. However, we can say what response we want to achieve. The first step is to play pink noise through the system and read the output level of each 1/3 octave band on the RTA. For tuning, you will want to have your system playing a slightly loud volume. With pink noise playing you should turn the system up so the response curve centers around 90dB. Your RTA will tell you the volume level in dB. Chart them each for dB level so you know how much you need to add or subtract much to make to bring them all close to the shape you want. Note that as much as possible you want to subtract with the EQ and not add, as adding gain with the equalizer can cause more stress on your amps and can add noise to the system. Then you need to decide what curve you want to have. Here are a few samples. Remember that these curves are what we want to see on the RTA. Your EQ graph will look far different.

Flat Response Curve
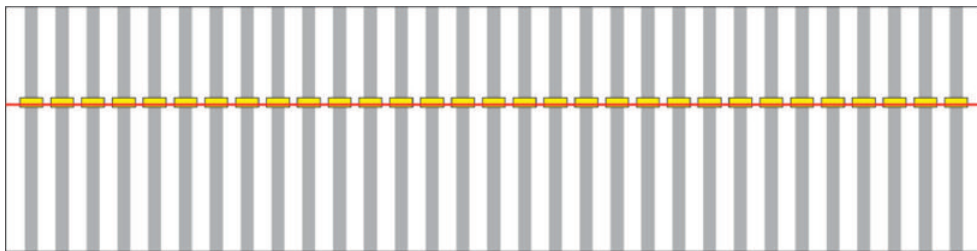
Many people try this first. a. It is very difficult b. It will almost always sound bad. It will be lacking in bass and sound harsh on the high end. How the ear works at different frequencies and volume levels affects what response will sound best.

Best Response Curve
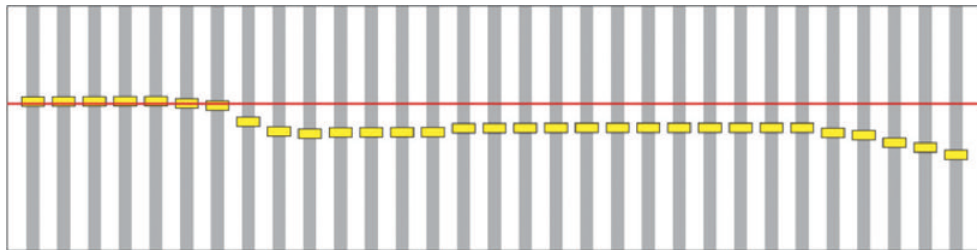
The best curve will be higher in the bass frequencies and will have only small changes from each 1/3 octave band to the next, then it will roll of at the higher frequencies.

A Good Response Curve
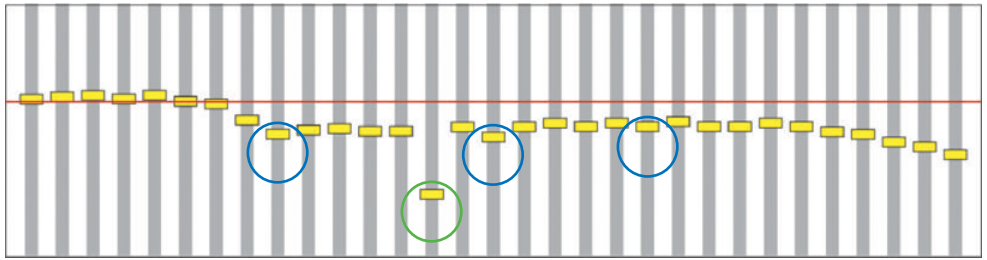
This is actually a good Frequency curve. There are some small out-of-line variations (Blue circles) but they are small and you won't hear them. There is one big variation (green circle) which is the single low point, but a) Your ear is not very sensitive to drop-outs so you likely won't notice it at all, and b) Trying to equalize it will only waste power and will likely distort the frequencies on either side of it. While it is best not to try to equalize a null point, you will want to check your crossovers. If you have a null point directly at the crossover between 2 drivers you may have a crossover spaced too far apart. But if the crossovers are OK then leave as is.

A Bad Response Curve

At the bottom line the sound you want from you car will be subject to your tastes. Everyone will like the "Best Response Curve" and everyone will like the "Good Response Curve". They may not be exactly what some want, but they will sound good and they will be comfortable to listen to. The reason is that there are no peaks in the response. The ear is very sensitive to frequency peaks and they irritate the listeners ears. This irritation causes "listener fatigue" and after a while the listener will want to turn the system down... or even off.

#1 and #2 Tuning issue

So, the number one goal in tuning is always to eliminate frequency peaks, and number 2 is always cut, don't boost. Boosting frequencies requires more amplifier power, increases the likelihood of distortion and causes increased noise. If you have diligently read this manual you now have a starting point to get the exact sound you want from your sound system in your vehicle. Tuning a sound system is a definitely a growth project. The more you tune and the more you listen, the better you will get. If you want to grow in your tuning ability the best thing you can do is go to car audio contests and listen to every car you can with music you are familiar with so you can compare those cars to your car. And make notes about what you liked as a reference for the next time you listen to your own system. For a few dollars you can enter the contests to get your car on the show floor. The guys at these shows are car audio fanatics and they want to spread the word. They will be more that glad to hop into your car and listen. And tell you what you can do to improve your system. This the very best source you will find to learn how you can improve tour tune.

DSP-Z8 IV II Series - Technical Specifications:

		DSP-Z8 IV II	ADSP-Z8 IV-8
DSP	**DSP Processor:**	Cirrus Logic CS47048	Cirrus Logic CS47048
	DSP Power/Res/SF:	150 MHz/32 bit/48 KHz	150 MHz/32 bit/48 KHz
	DSP Channels:	8	8
ADC	**ADC Processor**	Cirrus Logic CS5368	Cirrus Logic CS5368
	ADC Res/SF	24 bit / 192 KHz	24 bit / 192 KHz
	Dynamic Range/THD:	114 dB / -105 dB	114 dB / -105 dB
	ADC Channels:	8	8
DAC	**DAC Processor:**	Cirrus Logic CS47048	Cirrus Logic CS47048
	DAC Res/SF:	32 bit / 192 KHz	32 bit / 192 KHz
	Dynamic Range/THD:	108 dB / -98 dB	108 dB / -98 dB
	ADC Channels:	8	8
ANALOG IN	**Low level (Pre)/Sensitivity:**	8 / 1-5 VRMS	8 / 1-5 VRMS
	High Level (Spk In)/Sens.:	6 / 2-20 V	6 / 2-20 V
	AUX Inputs/Sensitivity:	1 / 0.2-4 VRMS	1 / 0.2-4 VRMS
DIGITAL IN	**Optical:**	24 bit-192 KHz	24 bit-192 KHz
ANALOG OUT	**Output Ch. RCA/Sensitivity:**	8 / 4 VRMS	-
SIGNAL STAGE	**Freq. Response (-3dB):**	10 Hz - 22.5 KHz	10 Hz - 22.5 KHz
	S/N Ratio Digital Input:	110 dBA	110 dBA
	S/N Ratio Analog Input:	106 dBA	106 dBA
	THD+N Digital Input:	0,002 %	0,002 %
	THD+N Analog Input:	0,005 %	0,005 %
	Crosstalk at 1 Khz:	90 dB	90 dB
EQUALIZER	**F/R Equalizer:**	1-6 ch Gr. & Par/31 poles	1-6 ch Gr. & Par/31 poles
	Effect Equalizer:	7-8 ch Gr. & Par/11 poles	7-8 ch Gr. & Par/11 poles
	Mute/Solo:	Yes, each channel	Yes, each channel
DELAY/POLARITY	**Time Align. (Range/Steps):**	0/15 ms / 0.02 ms	0/15 ms / 0.02 ms
	Max Delay (Cm/Steps):	515 cm / 0.68 cm	515 cm / 0.68 cm
	Polarity:	0/180°	0/180°
DASH BOARD	**Display (included):**	1" LCD	1" LCD
	Display (optional):	3" LCD Touch-Screen	3" LCD Touch-Screen
WIRELESS	**Bluetooth Streaming:**	Yes	Yes
CONNECTIONS	**PC/Dash Board:**	USB / RJ45	USB / RJ45
DIMENSIONS	**Main Unit:**	210(L) x 125(W) x 48(H)	222(L) x 230(W) x 52(H)
	Dash Board (1" LCD):	111(L) x 49(W) x 16(H)	111(L) x 49(W) x 16(H)

POWER

8 x 80 Watt/4 Ohm
8 x 120 Watt/2 Ohm
Bridged 8 x 240 Watt/4 Ohm

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